REMARKS

Favorable reconsideration is respectfully requested in view of the above amendments and following remarks. Claim 64 is new, and is supported for example by Example 1 on page 14, line 19 to page 15, line 7. Claims 1-20 and 61-64 are pending. No new matter has been added.

Claim rejections - 35 U.S.C. § 103

Claims 1-20 have been rejected under 35 U.S.C. §103(a) as obvious over DiSalvo (US 6,579,645) in view of Kelsey (US 2002/0158267). Applicants respectfully traverse this rejection.

DiSalvo teaches a method of obtaining GaN single crystals at temperatures less than 850°C and at pressures less than 120 atmospheres. DiSalvo distinguishes their method from previously disclosed methods which involve growing GaN single crystals directly from high-temperature and high-pressure melts. DiSalvo notes that GaN single crystals can be obtained at lower temperatures than heretofore reported by utilizing sodium as a flux in a reaction system containing only gallium, sodium and nitrogen, optionally in the presence of an alkaline earth metal catalyst. However, nothing in the reference teaches or suggests using a <u>mixed</u> flux containing sodium and at least one of an alkali metal other than sodium, and an alkaline metal as required by claim 1, let alone using a flux containing a material other than sodium. Therefore, claim 1 and the dependent claims therefrom are patentable over DiSalvo.

The rejection relies on Kelsey for a mixed flux containing sodium and at least one of an alkali metal other than sodium, and an alkaline metal. The rejection's reliance is misplaced. The rejection first contends that the Kelsey reference does teach growing gallium nitride crystal by melt with fluxes. The rejection seems to assume that the gallium nitride <u>powder</u> of Kelsey corresponds to the gallium nitride <u>single crystals</u> of DiSalvo. However, nothing in Kelsey teaches a method of forming a <u>single crystal</u> of gallium nitride. In fact, in paragraph [0013], Kelsey describes that the reaction between the nitrogen-containing gas with molten gallium alloy results in a gallium nitride <u>powder</u>. In paragraphs [0016] and [0017], Kelsey describes that direct nitridization of gallium metal or gallium oxide results in a gallium nitride <u>powder</u> for use in display devices. In paragraph [0007], Kelsey notes that the <u>powder</u> product comprises a particle size range useful in most display applications preferably in the range of two to ten microns. DiSalvo on the other hand distinguishes the gallium nitride products based on size. In particular, DiSalove in column 3, line 60 to column 4, line 3 describes products with sizes of

about 0.1 microns as GaN particles, products with sizes of about 3 microns as GaN grains, products with sizes of about 200 microns as granular GaN crystals and products with sizes above 500 microns as GaN single crystals. As such, it is abundantly clear that Kelsey is far from teaching a method of growing DiSalvo's gallium nitride single crystals, which are at least fifty times the size of Kelsey's particle products.

The rejection further contends that Kelsey teaches a similar method as set forth in the DiSalvo reference. However, as mentioned above, Kelsey is directed to a method of obtaining gallium nitride in powdered form used as a phosphor in a display device, whereas DiSalvo is directed to a method of growing large gallium nitride single crystals. Kelsey's method in fact is not capable of growing gallium nitride single crystals as described by DiSalvo. More particularly, in paragraphs [0016] and [0017], Kelsey describes a method of direct nitridization of gallium metal or gallium oxide in a NH_3 atmosphere. However, Shibata et al. in the Journal of Crystal Growth, 196, pp.47-52 (1999; enclosed herewith) makes it clear that the method as described by Kelsey in paragraphs [0016] and [0017] produces a large amount of GaN powder, but no single crystals. In paragraph [0013], Kelsey describes a method utilizing gas atomization of melts of gallium metal or gallium alloys or compounds. The method involves reacting nitrogen-containing gas with the atomized droplets to form gallium nitride powder. However, nothing in Kelsey teaches or suggests forming a gallium nitride single crystal. In fact, in order to obtain gallium nitride single crystals of DiSalvo under the method described in paragraph [0013] of Kelsey, a gallium melt would need to be formed at extremely high pressures (6.0 GPa) and extremely high temperatures (over 2000°C) as made clear by Utsumi et al. in Nature Materials, 2, pp. 735-39 (2003; enclosed herewith). DiSalvo on the other hand distinguishes themselves from methods that involve the use of such extreme conditions.

The rejection then contends that one of ordinary skill in the art would combine the references as the Kelsey reference gives motivation to add more than one flux. However, Kelsey and DiSalvo apply their fluxes in entirely different ways. Kelsey uses a flux to synthesize phosphor powders in order to obtain characteristics including very fine size, narrow size distribution, spherically shaped powders and good chemical homogeneity, leading to enhancement of luminescent properties. On the other hand, DiSalvo uses a flux for seeded growth of large single crystals used in light emitting diodes. As such, the fluxes used in the two

references are not functioning in such a way that their interchange from one system to the other would represent a predictable application of the known function. Accordingly, claim 1 and the dependent claims therefrom are patentable over the references, taken alone or separately.

The rejection also contends that the showing concerning improved results is not commensurate in scope with the claims. However, as shown in Figure 2 and described on page 16, lines 15-26 of the specification, a high quality Group-III-element nitride single crystal can be produced by using a mixed flux as required by claim 1, regardless of the ratio or amount of the flux. In contrast, when only sodium is used as a flux, the single crystal obtained is blackened (see comparative example on page 16). Therefore, Applicants respectfully submit that the showing in the specification concerning improved results is commensurate in scope with the claims.

Favorable reconsideration and withdrawal of the rejection are respectfully requested.

In view of the above, favorable reconsideration in the form of a notice of allowance is requested. Any questions or concerns regarding this communication can be directed to the attorney-of-record, Douglas P. Mueller, Reg. No. 30,300, at (612) 455.3804.

52835
PATENT TRADEMARK OFFICE

Dated: 1-2-08

Respectfully submitted,

HAMRE, SCHUMANN, MUELLER & LARSON, P.C.
P.O. Box 2902
Minneapolis, MN 55402-0902
(612) 455-3800

By: Curtis B. Hamre

Curtis B. Hamre
Reg. No. 29,165
CBH/ym

Enc:

Shibata et al., Synthesis of gallium nitride by ammonia injection into gallium melt, *Journal of Crystal Growth*, 196, pp. 47-52 (1999).

Utsumi et al., Congruent melting of gallium nitride at 6 GPa and its application to single-crystal growth, *Nature Materials*, 2, pp. 735-38 (2003).